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PENSOFT

Annotated checklist of amphibians and reptiles from Querétaro, Mexico, including new records, and comments on controversial species

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Abstract. We present an updated checklist of amphibians and reptiles of Querétaro, Mexico. The herpetofauna of Querétaro is composed of 136 species, 35 amphibians (seven caudates and 28 anurans) grouped in nine families and 20 genera; 101 reptiles (five turtles, 33 lizards, and 63 snakes) grouped in 20 families and 59 genera. We did not include 13 previous records that do not have adequate evidence. We include three newly reported species for Querétaro: *Coniophanes imperialis* (Baird & Girard, 1859), *Scaphiodontophis annulatus* (Duméril, Bibron & Duméril, 1854), and *Xenosaurus newmanorum* (Taylor, 1949). A total of 69 species (51% of the total species) are endemic to Mexico, while one species, *Sceloporus exsul* (Dixon, Ketchersid & Lieb, 1972), is endemic to the state. According to Mexican law (SEMARNAT NOM-059), 50 species are threatened or under special protection, while according to the IUCN red list, only 11 species are under some category of risk. We suggest that a greater survey effort for amphibians and reptiles is required to discover unrecorded species in those areas that have not been sufficiently sampled.

Keywords. Anurans, caudates, lizards, physiographic regions, Sierra Madre Oriental, snakes, Trans-Mexican Volcano Belt

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Introduction

The state of Querétaro is approximately 11,699 km^2 and represents 0.6% of the total area of Mexico (Gobierno del Estado de Querétaro 2002). The state contains three biogeographic provinces: the Sierra Madre Oriental, the Central Plateau, and the Trans-Mexican Volcano Belt (Morrone and Márquez 2003). Due to its complex orography and an elevation gradient ranging from 200 to 3,100 m a.s.l., a great variety of climatic conditions and vegetation types occur within a relatively small area (Zamudio 1992). The wide variety of environmental conditions has favored diversity and endemism in several vertebrate groups, including amphibians and reptiles (Ochoa-Ochoa et al. 2014).

Querétaro has recently been the subject of numerous

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herpetofaunistic studies focused on biochemistry, diversity, ecology, molecular systematics, and taxonomy, among other biological aspects of herpetozoans. These publications include scientific articles (Smith and Taylor 1950; Dixon et al. 1972a, 1972b; Padilla-García et al. 1996; Padilla-García and Mendoza-Quijano 1996a, 1996b, 1996c; Nieto et al. 2013; Cruz-Elizalde et al. 2019. 2022; Roldán-Padrón et al. 2019; Tepos-Ramírez et al. 2021a, 2021b, 2021c, 2022), science communication articles (Gillingwater and Patrikeev 2004; Jiménez-Velázquez and Cruz-Pérez 2011), book chapters (Cruz-Elizalde et al. 2016; Domínguez-Vega et al. 2019), books (Dixon and Lemos-Espinal 2010), natural history notes (Cruz-Pérez et al. 2009; Cruz-Pérez et al. 2014; Acosta and Tepos-Ramírez 2019; Tepos-Ramírez et al. 2019; Peralta-Robles et al. 2022), and theses (Padilla 2005; Tinoco 2005; Cabrera 2009; Zea 2010; Rayas 2019).

Smith and Taylor (1950) produced the first list and identification keys to the amphibians and reptiles of Mexico, reporting only 15 species of amphibians and reptiles from Querétaro. Dixon et al. (1972a) were first to focus exclusively on the herpetofauna of the state, recording 65 species of amphibians and reptiles from fieldwork carried out from 1950 to 1971. Nieto and Pérez (1999) reported 133 species in the state, and Dixon and Lemos-Espinal (2010) reported 117 species. Among these authors, the largest number of collections were by Nieto and Pérez (1999) and Dixon et al. (1972a), who deposited most of their collected material in foreign collections. For a detailed compilation of new records for the state and its authors, see Dixon and Lemos-Espinal (2010). The most recent list (Cruz-Elizalde et al. 2022) reports 129 species of amphibians and reptiles using records from national and foreign collections, as well as electronic repositories.

The differences in the number of species recorded between the most recent studies include several factors, but highlights the lack of recent fieldwork and a rigorous review of controversial or doubtful records. Our objective was to provide a checklist of Querétaro that contains novel and corroborated information on the herpetofauna occurring in the state. Therefore, we reviewed records deposited in scientific collections and included new records derived from fieldwork. We hope that this work will be a useful baseline for future studies.

Study Area

Querétaro is in the central region of Mexico bounded by coordinates 21.6700°N, 20.0150°S and 099.0431°E, 100.5967°W (INEGI 2017). To the north, it borders the state of San Luis Potosí, to the south with Mexico and Michoacán, to the east with Hidalgo, and to the west with Guanajuato. A great variety of vegetation types are present in Querétaro due to convergence of three biogeographic provinces. In the south of the state is the Trans-Mexican Volcano Belt, where the dominant vegetation types are low deciduous forest, grasslands, and oak forest. In the Central Plateau, vegetation types are associated with desert and semidesert regions, such as xerophilous scrub, grassland, and subdeciduous forest. In the Sierra Madre Oriental, are pine–oak forest, mountain mesophilic forest, and tropical deciduous forest (Zamudio et al. 1992).

Methods

Mapping. For a better understanding of the sampling effort made in Querétaro, we mapped 4,742 records of amphibians and reptiles (Table 1) obtained from online national and international repositories and citizen science portals (GBIF 2022). We used the Kernell Density Estimation (KDE) implemented in ArcGIS v. 10.5 to calculate the density of points around each output raster cell, generating a smoothly curved surface over each point. The surface value is highest at the location of the point and diminishes with increasing distance from the point.

Checklist conformation and species selection. We generated a preliminary checklist by reviewing previous works on the herpetofauna for Querétaro from Smith and Taylor (1950) to Cruz-Elizalde (2022) (see Introduction) and including information from collections in Mexico and the USA (GBIF 2022). For the final list, we only considered those records with a voucher specimen in a scientific collection, or with a reliable photographic record deposited in a scientific collection, or if it was directly observed by us in our fieldwork from 2010 to 2023, following Reyes (2019).

For fieldwork, we carried out intensive sampling in the preferred microhabitats of amphibians and reptiles, during two time intervals each day: 9:00–13:00 for diurnal species and 18:00–23:00 for crepuscular and nocturnal species. For reptiles, we used blanket sacks for transportation, while for amphibians, we used jars filled with humid substrate from the collection site to avoid desiccation. The specimens were photographed ex-situ inside a light box with a white background, and in-situ when the specimens were found. The collected specimens are part of the reference collection of the herpetofauna of Querétaro currently located in the Biotic Integrity Laboratory at the Faculty of Natural Sciences, Universidad Autónoma de Querétaro. Specimens were collected under collection permit issued by

Table 1. Number of records from the five major groups of amphibians and reptiles in Querétaro.

Taxon	Number of records
Class Amphibia	
Order Anura	1,436
Order Caudata	162
Class Reptilia	
Suborder Lacertilia	2,261
Suborder Serpentes	791
Suborder Testudines	92
Total	4,742

SEMARNAT (SGPA/DGVS/00027/22). All the photographs in this work are held in the Colección Nacional de Anfibios y Reptiles (CNAR) at Universidad Nacional Autónoma de México (UNAM), CDMX, México.

For a detailed revision, we focused our attention on records of species whose reported distribution in Mexico did not include Querétaro [e.g. *Aquiloeurycea scandens* (Walker, 1955), *Kinosternon scorpioides* (Linnaeus, 1766), and *Incilius valliceps* (Wiegmann, 1833)], those species that have been reported on few occasions [e.g. *Tlalocohyla picta* (Günther, 1901), *Trachycephalus vermiculatus* (Duméril & Bibron, 1841), *Pliocercus elapoides* (Cope, 1860), and *Thamnophis sumichrasti* (Cope, 1866)], and those species that have a complex taxonomic history capable of generating confusion (e.g. *Eleutherodactylus* spp. and *Sceloporus* spp.). When it was not possible to directly study the specimens held in foreign collections, we made inquiries through the digital repositories or by direct request to the curators of the collections to corroborate correct identification and provenance of the specimen (Table 2).

Classification. For amphibians, we follow the supraspecific classification proposed by Wilson et al. (2013), while for reptiles we follow Burbrink et al. (2020). Species names follow Frost (2021) for amphibians and Uetz et al. (2021) for reptiles. In cases of taxonomic controversy, we reviewed the expert literature to determine the current name and distribution (for amphibians: Hedges et al. 2008; Streicher et al. 2014; Grünwald et al. 2018; for reptiles: Hansen and Salmon 2017; Tepos-Ramírez et al. 2021a). All the specimens in this work were identified by external morphology, coloration, and measurements following the keys by Dixon and Lemos-Espinal (2010), as well as specific literature for new records and controversial species.

Results

The herpetofauna of Querétaro is composed of 136 species, including 35 amphibians (26 %) and 101 reptiles (74 %). We recorded nine families and 20 genera of amphibians and 20 families and 59 genera of reptiles (Table 3). Of the total number of species, 114 (83%) were observed or re-collected by us, and 22 (16%) are held in various collections.

Of the 136 recorded species, 69 are endemic to Mexico (19 amphibians and 50 reptiles), one reptile is endemic to Querétaro (*S. exsul*), and five are considered exotic species (*Hemidactylus frenatus*, *H. turcicus*, *Indotyphlops braminus*, *Graptemys pseudogeographica*, and *Trachemys scripta*). According to Mexican law (DOF, 2019), 50 species are threatened or under special protection, while according to the IUCN Red List (2022), only 11 species are under some category of risk (Table 3). Municipalities with the greatest numbers of records and species are Landa de Matamoros, Cadereyta de

Table 2. Annotated list of institutional collections from Mexico and the USA, and the number of records from Querétaro in each collection.

Acronym	Institution	Location	No. of records	Code
		Mexico		
CNAR	Colección Nacional de Anfibios y Reptiles	Universidad Nacional Autónoma de México	213	A
ENCB	Escuela Nacional de Ciencias Biológicas	Instituto Politécnico Nacional	9	B
MZFC	Museo de Zoología de la Facultad de Ciencias	Universidad Nacional Autónoma de México	1,485	C
		USA		
AMNH	American Museum of Natural History	New York	25	D
CM	Carnegie Museum of Natural History	Pittsburgh, Pennsylvania	55	E
CUMV	Cornell University Museum of Vertebrates	Cornell University	1	F
FMNH	Field Museum of Natural History	Chicago, Illinois	1	G
KU	Biodiversity Institute	University of Kansas	23	H
LACM	Natural History Museum of Los Angeles County	Los Angeles, California	75	I
LSU	University Museum of Natural Science	Louisiana State	2	J
MVZ	Museum of Vertebrate Zoology	University of California	78	K
SNMNH	San Diego Natural History Museum	San Diego Natural History Museum	5	L
TCWC	Biodiversity Research and Teaching Collection	Texas A&M University	1,006	M
UCM	Museum of Natural History	University of Colorado	6	N
UIMNH	Museum of Natural History	University of Illinois	31	O
UMMZ	Museum of Zoology	University of Michigan	107	P
USNM	Museum of Natural History	Smithsonian Institution	15	Q
UTA	Herpetology Collection, Arlington	Texas A&M University	28	R
UTEP	Herpetology Collection, El Paso	Texas A&M University	74	S
Total			3,238	

Table 3. Amphibians and reptiles from Querétaro, Mexico. IUCN Red List categories (Least Concern = LC, Near Threatened = NT,Vulnerable = VU, Endangered = EN, Critically Endangered = CR); and NOM-059-SEMARNAT-2010 (in danger of extinction = E, threatened = A; subject to special protection = Pr). Newly recorded from the state (*). Mexican endemics are indicated. Institution codes are included in Table 1.

Taxon	IUCN	NOM-059	Endemism	Institution code
Amphibia				
Anura				
Bufonidae				
Anaxyrus compactilis (Wiegmann, 1833)	LC	—	Mexico	A, C, M, O, H, P
Anaxyrus punctatus (Baird & Girard, 1852)	LC	—		A, C, I, M, P, S
Incilius nebulifer (Girard, 1854)	LC	—		C
Incilius occidentalis (Camerano, 1879)	LC	—	Mexico	A, C, B, I, M, O, H, S
Incilius valliceps (Wiegmann, 1833)	LC	—		C, M, Q
Rhinella horribilis (Wiegmann, 1833)	—	—		C, M
Craugastoridae				
Craugastor augusti (Dugès, 1879)	LC	—		C, H, M, P
Craugastor decoratus (Taylor, 1942)	LC	Pr	Mexico	C, H, I, M, P
Craugastor pygmaeus (Taylor, 1937)	LC	—		A
Craugastor rhodopis (Cope, 1867)	LC	—	Mexico	A
Eleutherodactylidae				
Eleutherodactylus guttilatus (Cope, 1879)	LC	—		C, M
Eleutherodactylus longipes (Baird, 1859)	LC	—	Mexico	A, C, H, M
Eleutherodactylus verrucipes (Cope, 1885)	LC	Pr	Mexico	C, B, M, P, R
Hylidae				
Dryophytes arenicolor (Cope, 1866)	LC	—		A, C, H, E, M, S
Dryophytes eximius (Baird, 1854)	LC	—	Mexico	A, C, H, E, M, N, O, S
Rheohyla miotympanum (Cope, 1863)	LC	—	Mexico	A, C, M
Scinax staufferi (Cope, 1865)	LC	—		C
Smilisca baudinii (Duméril & Bibron, 1841)	LC	—		C, K, M, R
Tlalocohyla godmani (Günther, 1901)	VU	A	Mexico	C
Tlalocohyla picta (Günther, 1901)	LC	—		C
Trachycephalus vermiculatus (Linnaeus, 1758)		—		K
Microhylidae				
Hypopachus variolosus (Cope, 1866)	LC	—		C, M
Ranidae				
Lithobates berlandieri (Baird, 1859)	LC	Pr		A, C, H, K, M, Q
Lithobates montezumae (Baird, 1854)	LC	Pr	Mexico	A, C, D, G, M, P
Lithobates neovolcanicus (Hillis & Frost, 1985)	LC	A	Mexico	M
Lithobates spectabilis (Hillis & Frost, 1985)	LC	—	Mexico	B, C
Scaphiopodidae				
Scaphiopus couchii (Baird, 1854)	LC	—		M
Spea multiplicata (Cope, 1863)	LC	—		C, E, H, M, O, P, Q
Caudata				
Ambystomatidae				
Ambystoma velasci (Dugès, 1888)	LC	Pr	Mexico	A
Plethodontidae				
Aquiloeurycea cephalica (Cope, 1865)	LC	A	Mexico	A, C, I, K, M, Q
Bolitoglossa platydactyla (Gray, 1831)	LC	Pr	Mexico	A
Chiropterotriton chondrostega (Taylor, 1941)	EN	Pr	Mexico	A, I, K, M
Chiropterotriton magnipes (Rabb, 1965)	EN	Pr	Mexico	C
Chiropterotriton multidentatus (Taylor, 1939)	EN	Pr	Mexico	A, C, H, P
Isthmura bellii (Gray, 1850)	LC	A	Mexico	A, C, D, M, P

Taxon	IUCN	NOM-059	Endemism	Institution code
Reptilia				
Testudines				
Kinosternidae				
Kinosternon hirtipes (Wagler, 1830)	LC	Pr		B, M
Kinosternon integrum (Le Conte, 1854)	LC	Pr	Mexico	A, C, D, M, P, S
Emydidae				
Graptemys pseudogeographica (Gray, 1831)	LC	—		A
Trachemys scripta (Thunberg, 1792)	LC	Pr		A
Trachemys venusta (Gray, 1855)	—	—		A
Squamata				
Lacertilia				
Anguidae				
Abronia taeniata (Wiegmann, 1828)	VU	Pr	Mexico	C, E, M
Barisia ciliaris (Smith, 1942)	—	—	Mexico	A, C, M
Gerrhonotus infernalis (Baird, 1859)	LC	—		C
Gerrhonotus ophiurus (Cope, 1867)	LC	—	Mexico	C
Corytophanidae				
Corytophanes hernandesii (Wiegmann, 1831)	LC	Pr		A
Laemanctus serratus (Cope, 1864)	LC	Pr		C
Dactyloidae				
Anolis sericeus (Hallowell, 1856)	LC	—		C, M
Dibamidae				
Anelytropsis papillosus (Cope, 1885)	LC	A	Mexico	A, I, M, S
Gekkonidae				
Hemidactylus frenatus (Duméril & Bibron, 1836)	LC	—		C
Hemidactylus turcicus (Linnaeus, 1758)	LC	—		A
Phrynosomatidae				
Phrynosoma orbiculare (Linnaeus, 1758)	LC	A	Mexico	A, C, M, P
Sceloporus aeneus (Wiegmann, 1828)	LC	—	Mexico	A, C, M, P
Sceloporus dugesii (Bocourt, 1874)	LC	—	Mexico	A, C, I, L, M, S
Sceloporus exsul (Dixon, Ketchersid & Lieb, 1972)	CR	A	Querétaro, Mexico	C, M, S
Sceloporus grammicus (Wiegmann, 1828)	LC	Pr		A, C, D, I, M, P, S
Sceloporus melanogaster (Cope, 1885)	—	—	Mexico	A, B, C, D, E, I, K, M, P, R, S
Sceloporus minor (Cope, 1885)	LC	—	Mexico	C
Sceloporus mucronatus (Cope, 1885)	LC	—	Mexico	A
Sceloporus parvus (Smith, 1934)	LC	—	Mexico	A, C, I, M, S
Sceloporus scalaris (Wiegmann, 1828)	LC	—	Mexico	M, P
Sceloporus spinosus (Wiegmann, 1828)	LC	—	Mexico	A, C, D, E, H, I, L, M, P, S
Sceloporus variabilis (Wiegmann, 1834)	LC	—		A, B, C, E, I, M, P, Q, S
Scincidae				
Plestiodon lynxe (Wiegmann, 1834)	LC	Pr	Mexico	A, C, I, K, M, P, R
Plestiodon tetragrammus (Baird, 1859)	LC	—		C, M
Scincella gemmingeri (Cope, 1864)	LC	—	Mexico	E, M
Scincella silvicola (Taylor, 1937)	LC	A	Mexico	C, M
Teiidae				
Aspidoscelis gularis (Baird & Girard, 1852)	LC	—		A, C, D, E, I, M, N, O, S
Holcosus amphigrammus (Smith & Laufe, 1945)	—	—	Mexico	C
Xantusidae				
Lepidophyma gaigeae (Mosauer, 1936)	VU	Pr	Mexico	A, C, E, I, K, M, P, R, S
Lepidophyma occulor (Smith, 1942)	LC	Pr	Mexico	M, R
Lepidophyma sylvaticum (Taylor, 1939)	LC	Pr	Mexico	A, I, M, P

Taxon	IUCN	NOM-059	Endemism	Institution code
Xenosauridae				
Xenosaurus mendozai (Nieto, García, Zúñiga & Schmidt, 2013)	—	—	Mexico	A, C
*Xenosaurus newmanorum** (Taylor, 1949)	EN	Pr	Mexico	A
Squamata				
Serpentes				
Boidae				
Boa imperator (Daudin, 1803)	LC	—		A
Colubridae				
Conopsis lineata (Kennicott, 1859)	LC	—	Mexico	A, C, I, M, P
Conopsis nasus (Günther, 1858)	LC	—	Mexico	A, C, E, I, M, P, S
Drymarchon melanurus (Duméril, Bibron & Duméril, 1854)	LC	—		C, M
Drymobius margaritiferus (Schlegel, 1837)	LC	—		M
Ficimia olivacea (Gray, 1849)	LC	—	Mexico	M, R
Ficimia streckeri (Taylor, 1931)	LC	—		C
Gyalopion canum (Cope, 1860)	LC	—		M
Lampropeltis polyzona (Cope, 1860)	LC	—	Mexico	C, M, R
Lampropeltis ruthveni (Blanchard, 1920)	NT	A	Mexico	A
Leptophis mexicanus (Duméril, Bibron & Duméril, 1854)	LC	A		C
Masticophis mentovarius (Duméril, Bibron & Duméril, 1854)	LC	—		C
Masticophis schotti (Baird & Girard, 1853)	LC	—		L
Masticophis taeniatus (Hallowell, 1852)	LC	—		C, M
Mastigodryas melanolomus (Cope, 1868)	LC	—		A, C
Oxybelis potosiensis (Taylor, 1941)	—	—	Mexico	I, M
Pantherophis emoryi (Baird & Girard, 1853)	LC	—		A
Pituophis deppei (Duméril, 1853)	LC	A	Mexico	C, D, E, I, M, P, R, S
Pliocercus elapoides (Cope, 1860)	LC	A		C
*Scaphiodontophis annulatus** (Duméril, Bibron & Duméril, 1854)	LC	—		A
Salvadora bairdi (Jan, 1860)	LC	Pr	Mexico	C, D, I, M, Q
Salvadora lineata (Schmidt, 1940)	—	—		H, M, R
Senticolis triaspis (Cope, 1866)	LC	—		C, I, M
Spilotes pullatus (Linnaeus, 1758)	LC	—		C
Tantilla bocourti (Günther, 1895)	LC	—	Mexico	C, I, M
Tantilla rubra (Cope, 1875)	LC	Pr		M
Trimorphodon tau (Cope, 1870)	LC	—	Mexico	A, C, I, M, P, R, S
Dipsadidae				
Adelphicos quadrivirgatum (Jan, 1862)	LC	—		C, M
Amastridium sapperi (Werner, 1903)	LC	—		F
Chersodromus rubriventris (Taylor, 1949)	EN	Pr	Mexico	M
Coniophanes fissidens (Günther, 1858)	LC	—		C
*Coniophanes imperialis** (Baird & Girard, 1859)	LC	—		A
Coniophanes taeniata (Peters, 1870)	—	—	Mexico	P
Diadophis punctatus (Linnaeus, 1766)	LC	—		M, P
Geophis latifrontalis (Garman, 1883)	—	Pr	Mexico	A, M, P
Geophis mutitorques (Cope, 1885)	LC	Pr	Mexico	I, M
Geophis sartorii (Cope, 1863)	LC	—		K, M, R
Hypsiglena jani (Dugès, 1865)	LC	Pr		C, I, M, R, S
Imantodes gemmistratus (Cope, 1861)	LC	Pr		C
Leptodeira septentrionalis (Kennicott, 1859)	LC	—		C, M, R
Ninia diademata (Baird & Girard, 1853)	LC	—		C

Taxon	IUCN	NOM-059	Endemism	Institution code
Rhadinaea gaigeae (Bailey, 1937)	—	—	Mexico	A, C, H, I, M, P, S
Elapidae				
Micrurus tener (Baird & Girard, 1853)	LC	—		C, M, P, R
Leptotyphlopidae				
Epictia wynni (Wallach, 2016)	—	—	Mexico	E, I, M, Q
Rena dulcis (Baird & Girard, 1853)	LC	—		C, E, M, O
Natricidae				
Storeria dekayi (Holbrook, 1839)	LC	—		A
Storeria hidalgoensis (Taylor, 1942)	VU	—	Mexico	A, I, M
Storeria storerioides (Cope, 1866)	LC	—	Mexico	C
Thamnophis cyrtopsis (Kennicott, 1860)	LC	A		C, M, S
Thamnophis eques (Reuss, 1834)	LC	A		A, C, D, J, M, P, S
Thamnophis melanogaster (Peters, 1864)	EN	A	Mexico	A, C, D, M, P
Thamnophis pulchrilatus (Cope, 1885)	LC	—	Mexico	M
Thamnophis scalaris (Cope, 1861)	LC	A	Mexico	P
Thamnophis sumichrasti (Cope, 1866)	LC	A	Mexico	C, M
Typhlopidae				
Indotyphlops braminus (Daudin, 1803)	—	—		C, M, P
Viperidae				
Bothrops asper (Garman, 1883)	LC	—		C
Crotalus aquilus (Klauber, 1952)	LC	Pr	Mexico	C
Crotalus atrox (Baird & Girard, 1853)	LC	Pr		M
Crotalus molossus (Baird & Girard, 1853)	LC	Pr		C, M, P
Crotalus polystictus (Cope, 1865)	LC	Pr	Mexico	A
Crotalus scutulatus (Kennicott, 1861)	LC	Pr		C, E, P
Crotalus totonacus (Gloyd & Kauffeld, 1940)	LC	—	Mexico	C, M
Metlapilcoatlus borealis (Tepos-Ramírez, Flores-Villela, Velasco, Pedraza-Lara, García-Rubio & Jadin, 2021)	—	—	Mexico	C

Table 4. Number of records by municipality currently held in electronic repositories.

Municipality	No. of species	Records	%
Landa de Matamoros	87	808	17.0
Cadereyta de Montes	71	769	16.2
Jalpan de Serra	82	461	9.7
Arroyo Seco	56	386	8.1
Querétaro	42	371	7.8
Pinal de Amoles	61	364	7.7
San Juan del Río	43	336	7.1
Amealco de Bonfil	37	221	4.7
Peñamiller	49	188	4.0
Colón	31	155	3.3
San Joaquín	35	127	2.7
El Marqués	31	116	2.4
Ezequiel Montes	24	97	2.0
Tolimán	29	93	2.0
Corregidora	27	88	1.9
Tequisquiapan	24	68	1.4
Huimilpan	22	66	1.4
Pedro Escobedo	16	28	0.6
Total		4,742	100

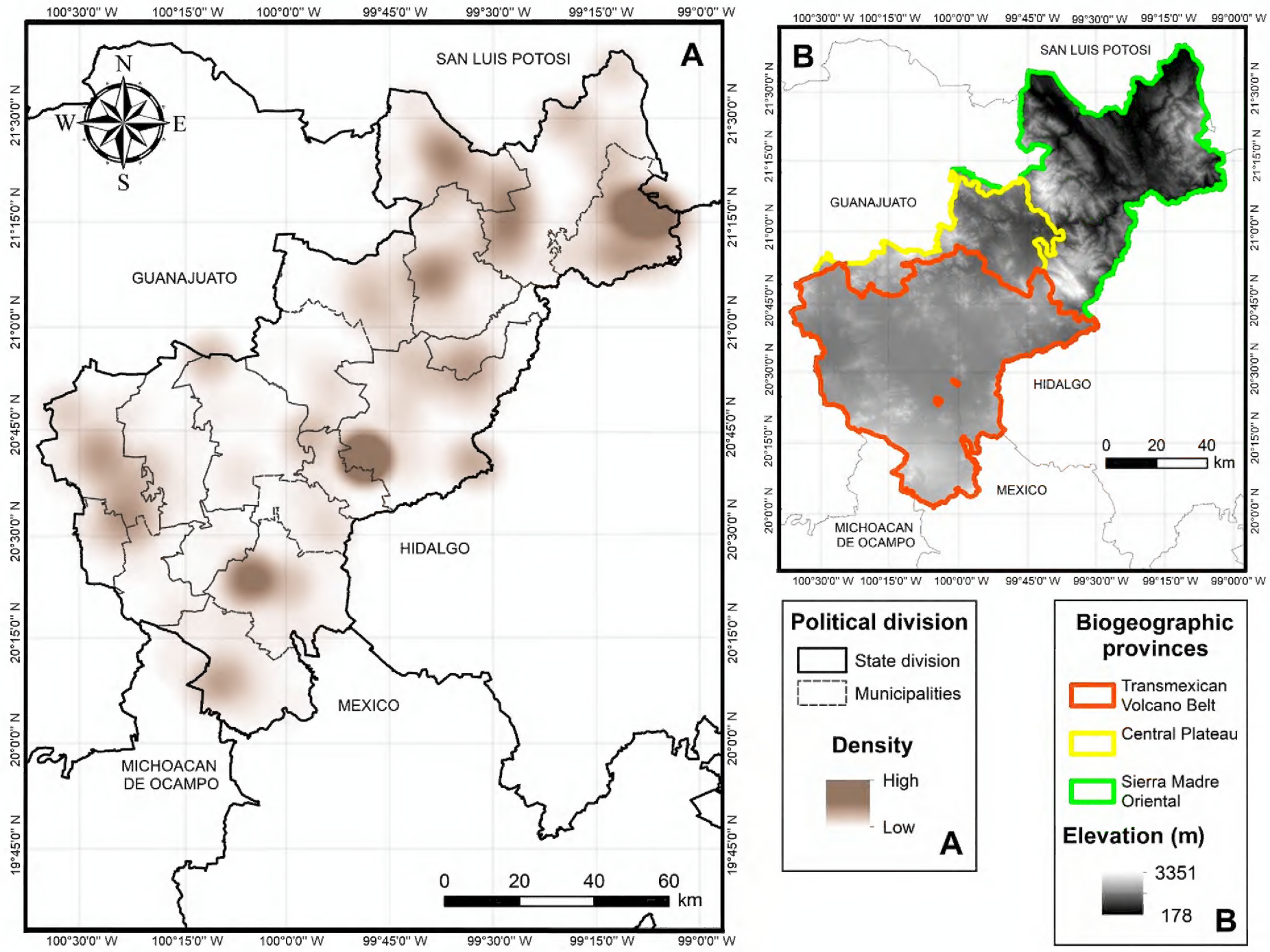

Figure 1. A. Density map by points where shaded areas represent places with higher sampling effort; bold lines represent state lines and thin lines represent municipalities within Querétaro. **B.** Digital elevation model with the three biogeographical regions present in Querétaro indicated in color.

Montes and Jalpan de Serra (Table 4).

Class Amphibia
Order Caudata
Family Ambystomatidae

***Ambystoma velasci* (Dugès, 1888)**
Figure 2A

Material examined. MEXICO – **Querétaro** • Pinal de Amoles, El Cedral; 21.1414°N, 099.6399°W; elev. 2215 m; 3.IX.2022; Oscar García Rubio obs.; sex undetermined, CNAR-RF 892 (photograph).

The specimen was captured at the bottom of a natural pond.

Identification. *Ambystoma velasci* is the largest species of the genus. It has approximately 14–18 gill rakers per side (Irschich and Shaffer 1977). Adults have lungs and lack nasolabial folds (Dixon and Lemos-Espinal 2010).

Remarks. This species has a wide geographical distribution, from northern Chihuahua state to central Mexico, alsoin the mountains of the Trans-Mexican Volcanic Belt and through the Mexican Altiplano (Contreras-Calvario 2021).

Family Plethodontidae

***Aquiloeurycea cephalica* (Cope, 1865)**
Figure 2B

Material examined. MEXICO – **Querétaro** • Pinal de Amoles, Puerto de los Velázquez; 21.1260°N, 099.6739°W; elev. 2671 m; 29.VIII.2021; Mauricio Tepos Ramírez obs.; sex undetermined, CNAR-RF 893 (photograph).

The specimen was found under a rock in an oak forest.

Identification. *Aquiloeurycea cephalica* has a flattened head. Snout truncated with the nasolabial region extending far beyond the lower lip. Tail slightly shorter than body, thickened near base. Limbs well developed; fingers and toes partially webbed with flattened tips. Dorsum and venter black to bluish blackish gray, with irregular cream to silvery white, licheniform markings on the upper and lower parts of the tail and the belly (Raffaëlli 2014).

Remarks. This species is endemic to central Mexico; it is distributed along the Trans-Mexican Volcanic Belt. Classified as Threatened by the Mexican Official Norm 059-SEMARNAT-2010 (DOF 2019) and Least Concern by the IUCN.

***Isthmura bellii* (Gray, 1850)**
Figure 2C

Figure 2. Some amphibians of Querétaro, Mexico. **A.** *Ambystoma velsaci* (Dugès, 1888). **B.** *Aquiloeurycea cephalica* (Cope, 1865). **C.** *Isthmura belli* (Gray, 1850). **D.** *Bolitoglossa platydactyla* (Gray, 1831). **E.** *Chiropterotriton chondrostega* (Taylor, 1941). **F.** *Craugastor pygmaeus* (Taylor, 1937). **G.** *Craugastor rhodopis* (Shannon & Werler, 1955). **H.** *Rheohyla miotympanum* (Cope, 1863). Photographs by ORGR (A–C, F–H), Ezau Garay Hernández (B), and MTR (E).

Material examined. MEXICO – **Querétaro** • Pinal de Amoles, La Pingüica; 21.1260°N, 099.6739°W; elev. 2671 m; 29.VIII.2021; Alison Khadije Salinas Olguín obs.; sex undetermined, CNAR-RF 894 (photograph).

This salamander was found under a slab-shaped rock, in a pine forest (*Pinus* spp.).

Identification. This salamander can be distinguished from other species of this genus by the presence of a marked nasolabial fold in males. Dorsum black, with a paravertebral row of bright orange spots. Limbs separated by 1–3 intercostal folds when the arm and the leg are adpressed (Lowe et al. 1968; Dixon and Lemos-Espinal 2010).

Remarks. This species is endemic to Mexico. It is widely distributed from Sonora, Chihuahua, and Tamaulipas to Oaxaca. There is a population from Tamaulipas with a dorsal pattern differing from typical *I. bellii* from the Trans-Mexican Volcanic Belt and Querétaro (Dixon and Lemos-Espinal 2010).

Bolitoglossa platydactyla (Gray, 1831)

Figure 2D

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Neblinas; 21.2668°N, 099.0578°W; elev. 919 m; 29.XI.2020; Ezau Garay Hernández and Jesús de

Jair Garay Hernández obs.; sex undetermined, CNAR IBH-648 (photograph).

The specimen was found under a rock in a tropical subdeciduous forest, dominated by elm (*Ulmus* sp.), oak (*Quercus* spp.), pochote (*Ceiba* sp.), and cherry (*Aphananthe* sp).

Identification. *Bolitoglossa platydactyla* is one of the largest specimens of the genus. Elongated limbs, relatively large head, almost completely webbed fingers and toes. Broad, yellowish dorsal stripe from the top of the head to the end of the tail, with partially irregular margins, often with black speckling, sometimes immaculate (Raffaëlli 2014).

Remarks. This species is endemic to Mexico. It is in the Special Protection category (DOF 2019) and Least Concern in the IUCN Red List.

***Chiropterotriton chondrostega* (Taylor, 1941)**

Figure 2E

Material examined: MEXICO – **Querétaro • Landa de Matamoros, La Yesca**; 21.2227°N, 099.1520°W; elev. 1886 m; 13.VII.2022; Cristhian Alejandro Peralta Robles obs.; sex undetermined, CNAR-RF 895 (photograph).

This specimen was found between bromeliad bracts (*Tillandsia deppeana*) in a cloud forest.

Identification. The diameter of the eye is greater than the length of the snout. The snout is rounded and truncated at its tip; and compared with sympatric congeners, smaller feet, shorter limbs, and narrower head (Dixon and Lemos-Espinal 2010). This species may vary in its color pattern, but it usually exhibits a brown dorsum with a middorsal red stripe (Dixon and Lemos-Espinal 2010).

Remarks. It is distributed from northern Hidalgo, through the Sierra Madre Oriental in Querétaro to San Luis Potosí and southwestern Tamaulipas. It mainly inhabits pine–oak forests, fir forests, and cloud forests between 1,560 and 2,700 m a.s.l. Preferred microhabitats are under rocks, bark from rotten logs, moss, fallen bromeliads, and other objects on the forest floor (Rab 1958; Dixon and Lemos-Espinal 2010).

Order Anura
Family Craugastoridae

***Craugastor pygmaeus* (Taylor, 1937)**

Figure 2F

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, La Yesca; 21.2108°N, 099.1221°W; elev. 1893; 26.VIII.2021; Geovani Gómez Recoder obs.; sex undetermined, CNAR-RF 896 (photograph).

The specimen was found under leaf litter in a mountain mesophyll forest.

Identification. *Craugastor pygmaeus* is one of the smallest frogs in Querétaro. The head is almost triangular. The body may be smooth or warty. The limbs are long and slender, the fingers slightly short and lacking interdigital membrane, and there are well-developed subarticular tubercles (Köhler 2013).

Remarks. Its distribution extends from southeastern Michoacán to the extreme western Guatemala. This species was recently reported from Querétaro (Tepos-Ramírez et al. 2022).

***Craugastor rhodopis* (Shannon & Werler, 1955)**

Figure 2G

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, Valle Verde; 21.5033°N, 099.1665°W; elev. 1307 m; 11.VIII.2015; Mauricio Tepos Ramírez obs.; sex undetermined, CNAR IBH-647 (photograph).

The frog was found resting on leaf litter in a mountain mesophyll forest.

Identification. According to Streicher et al. (2014), the most reliable trait to distinguish species of the *Craugastor rhodopis* group is geographic distribution. However, *C. rhodopis* can be distinguished from other *Craugastor* species by the lack of digital pads on the innermost fingers, at least the thumb and toes (Köhler 2013).

Remarks. Populations of *C. rhodopis* were recorded from the highlands of Veracruz and Hidalgo, as well as southeastern Chiapas and Oaxaca (Frost 2021). The northernmost record, in Hidalgo, was reported by Streicher et al. (2014). This frog was recently reported in Jalpan, Querétaro, where it inhabits cloud forest (Tepos-Ramírez et al. 2022).

Family Hylidae

***Rheohyla miotympanum* (Cope, 1863)**

Figure 2H

Material examined. MEXICO – **Querétaro** • Cadereyta de Montes, Maconí; 20.8453°N, 099.5394°W; elev. 1674 m; 11.X.2017; Karla-Zaldaña and Oscar-Rayas obs.; 1♂, CNAR-RF 897 (photograph).

This frog was found very close to a stream surrounded by riparian vegetation.

Identification. This is a small-bodied *Rheohyla* (SVL in ♀ = 27–32 mm). The species is recognizable by the distinctive white to yellow stripes along the edge of the upper lip, across the anus, and on the outer edges of the forelimbs and feet. These stripes are not present in any other amphibian in Querétaro (Duellman 2001).

Remarks. This species is widely distributed along the Pacific versant of Mexico and a small portion of the Trans-Mexican Volcano Belt. Recent analysis by Rayas et al. (2019) found a complex genetic structure across its geographic range, indicating the presence of cryptic species in some populations.

Order Testudines
Family Emydidae

***Graptemys pseudogeographica* (Gray, 1831)**

Material examined. MEXICO – **Querétaro** • Cadereyta de Montes, Cadereyta; 21.6915°N, 099.8116°W; elev.

2037 m; 03.V.2017IBH-RF 651; José Belem Hernández Díaz obs.; sex undetermined.

The specimen was observed basking on the edge of an artificial pond; it may have been a released pet.

Identification. *Graptemys pseudogeographica* is a turtle endemic to the United States and is occasionally kept as a pet. The carapace is brown, and the middorsal keel has the suggestion of knobs. There is a light spot or line posterior to eye, and light neck stripes may reach the eye. The head is relatively small (Conant and Collins 1998).

Remarks. This is an invasive species in Mexico. These turtles are strong swimmers and voracious predators. *Graptemys pseudogeographica* should be removed and monitored to minimize damage to the ecosystems it invades.

***Trachemys venusta* (Gray, 1855)**

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, Presa Jalpan; 21.2049°N, 099.4708°W; elev. 775 m; 21.III.2021; IBH-RF 653; Raúl Hernández Árciga obs.; sex undetermined.

The turtle was observed basking on the shore of the Jalpan dam.

Identification. *Trachemys venusta* is a medium-sized turtle, with an olive carapace having irregular yellow or orange lines, and ocelli on the carapace and plastron (Conant and Collins 1998).

Remarks. This species has a diverse diet which allows them to be well-adapted to varied ecosystems when released. Their potential as an invasive species is remarkable.

Order Squamata (Lacertilia)
Family Anguidae

***Abronia taeniata* (Wiegmann, 1828)**
Figure 3A

Material examined: MEXICO – **Querétaro** • Caderey-ta, La Esperanza; 20.8916°N, 099.5399°W; elev. 2350 m; 10.III.2022; Fátima Soledad Garduño-Fonseca obs.; 1♀, CNAR-RF 898 (photograph).

The lizard was found emerging from a tubular cavity of limestone in an oak forest.

Identification. This is a medium-sized lizard (SVL = 10–138 mm). The body is elongate, the legs are short legs, and the tail is prehensile. The enlarged, depressed head has the following scale counts: transverse nuchal rows 4–6 and transverse dorsal rows 31–34. The dorsum is creamy white to yellow or greenish yellow or grayish green, with six to eight dark, transverse bands; the tail has incomplete transverse ventral bands (Dixon and Lemos-Espinal 2010; Campbell and Frost 1993; Sánchez-Herrera et al. 2017; Lemos-Espinal and Dixon 2013; Good 1988).

Remarks. Distributed in Mexico, Guatemala, El Salvador, and Honduras (Villamar-Duque et al. 2019). In Mexico it has been reported from Tamaulipas, Puebla, San Luis Potosí, Nuevo León, Hidalgo, Veracruz, and Querétaro. It is found in cloud forests with abundant bromeliads, ferns, and mosses, and often is found in cracks in limestone rocks, which are possibly used as hibernacula. It occurs at elevations of 1,000–2,600 m a.s.l. (Dixon and Lemos-Espinal 2010).

Family Corytophanidae

***Corytophanes hernandesii* (Wiegmann, 1831)**
Figure 3B

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Neblinas; 21.2668°N, 099.0578°W; elev. 860 m; 25.VIII.2020; Ezau Garay Hernández and Jesús de Jair Garay Hernández obs.; sex undetermined, CNAR-RF 899 (photograph).

This lizard was seen basking on a rock at noon, in a subhumid tropical forest.

Identification. This is a medium-sized lizard (SVL = 105 mm) with a laterally compressed body. It is characterized by a short, triangular cephalic helmet projecting beyond the posterior part of the head but disjunct from the middorsal crest. The helmet is formed by ridges rising from the canthal region above the eyes, and the posterior ridges join and curve downwards. The supraocular and parietal scales are keeled, and there is a prominent spiny scale above each tympanum. The dorsum is green with gray or brown patches outlined with white on the shoulders (Smith and Burger 1950; McCranie et al. 2004).

Remarks. This species occurs in Mexico, Guatemala, Belize, and Honduras. Within Mexico it occurs in eastern Puebla, central Veracruz, Tabasco, and Chiapas (Wilson et al. 2010). It can be found in tropical forests, humid, seasonal, subtropical humid, and secondary forests but not in highly disturbed areas. It lives from sea level to 1,400 m a.s.l. (Wilson et al. 2010).

Family Gekkonidae

***Hemidactylus turcicus* (Linnaeus, 1758)**

Material examined. MEXICO – **Querétaro** • Municipality of Querétaro Santiago de Querétaro; 20.6330°N, 100.4471°W; elev. 1800 m; IBH-T-492; Mauricio Tepos-Ramírez and Leonardo Álvarez obs.; 1♂ (photograph).

The specimen was photographed inside a residence in a southern suburb of Querétaro City.

Identification. This is a relatively small gecko (SVL = 10–13 cm). It differs from all native lizards by having sticky toe pads, vertical pupils, and eyes lacking eyelids (Loveridge 1947). It is generally light gray or almost white with dark mottling. This species can be easily distinguished from the only other gecko species in Querétaro (*Hemidactylus frenatus*) by its bumpy or warty skin.

Remarks. This gecko is not native in Mexico. The closest record to the city of Querétaro is from Tlahualilo, Durango, 693 km away (Álvarez-Romero 2008). Because other specimens of different age classes have

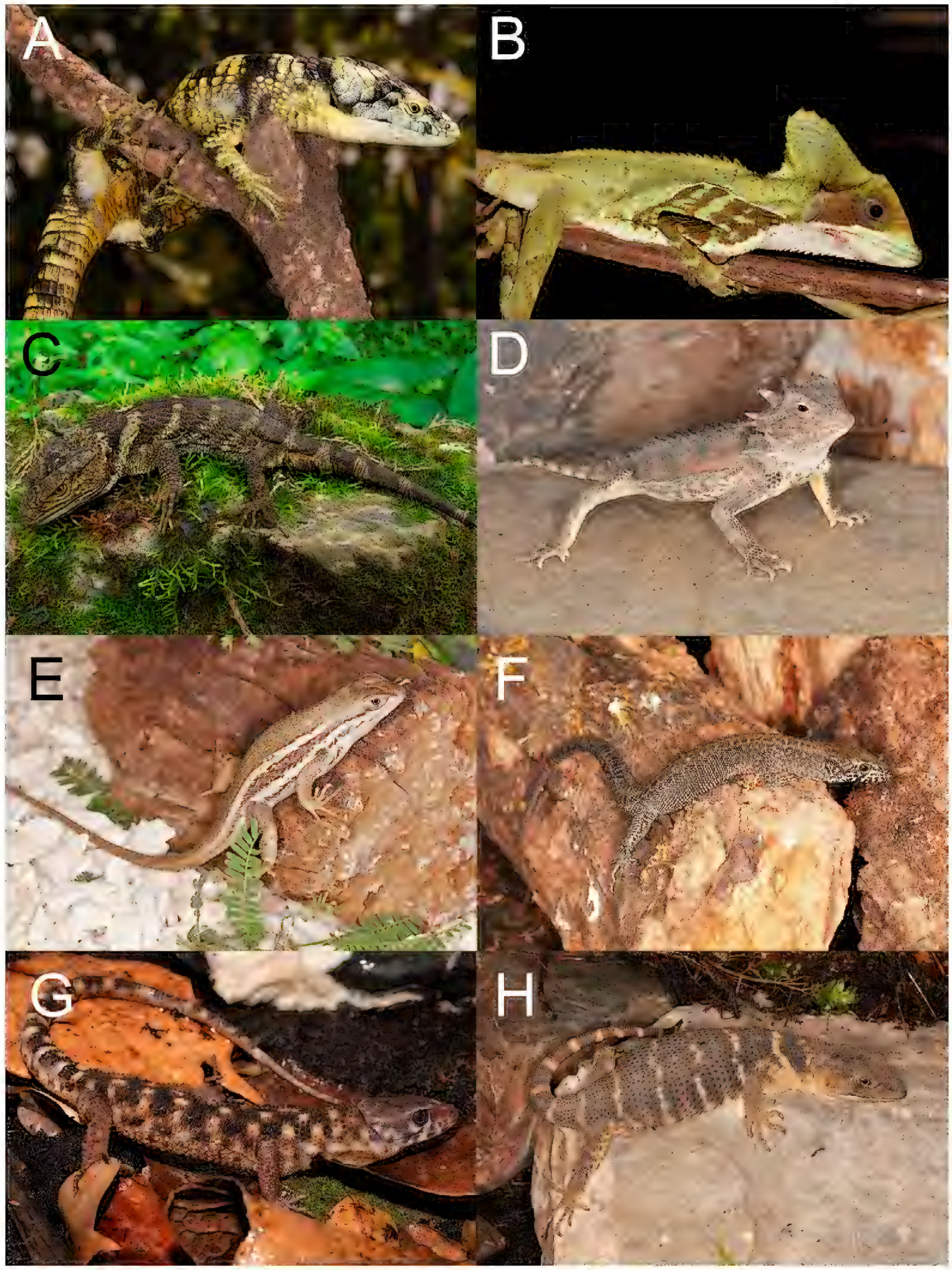

Figure 3. Some lizards of Querétaro, Mexico. **A.** *Abronia taeniata* (Wiegmann, 1828). **B.** *Corytophanes hernandesii* (Wiegmann, 1831). **C.** *Xenosaurus newmanorum* (Taylor, 1949). **D.** *Phrynosoma orbiculare* (Linnaeus, 1758). **E.** *Sceloporus exsul* (Dixon, Ketchersid & Lieb, 1972). **F.** *Lepidophyma gaigae* (Mosauer, 1936). **G.** *Lepidophyma occulor* (Smith, 1942). **H.** *Xenosaurus mendozai* (Nieto, García, Zúñiga & Schmidt, 2013). Photographs by ORGR (A, D– H), MTR (B), and Gonzalo Medina Rangel (C).

been observed nearby, it is assumed that there is a viable breeding population in Querétaro.

Family Phrynosomatidae

***Phrynosoma orbiculare* (Linnaeus, 1789)**

Figure 3D

Material examined. MEXICO – **Querétaro** • Amealco de Bonfil, Amealco; 20.1798°N, 100.1542°W; elev. 2605 m; 8.VII.2021; Mauricio Tepos Ramírez obs.; 1♀, CNAR-RF 901 (photograph).

This lizard was found in an oak forest next to a log in sandy soil.

Identification. The body is dorsolaterally flattened. There are conical middorsal scales, smooth ventrals, and a pair of occipital horns and three temporal horns on each side; all are approximately the same size. The tail is shorter than the body (Moreno-Barajas et al. 2013; Dixon and Lemos-Espinal 2010). The coloration varies from gray to dull yellow, with grayish brown or dark brown spots extending over the shoulders and neck, and the tail is banded with dark and light gray and the venter has a reticulate pattern of dark gray and

cream (Dixon and Lemos-Espinal 2010).

Remarks. The subspecies inhabiting Querétaro is *P. orbiculare dugesii* (Duméril & Bocourt, 1870), which has a wide distribution from Nuevo León, extreme southwestern Tamaulipas and southeastern Coahuila through northern Hidalgo, Querétaro, San Luis Potosí, Aguascalientes, and Zacatecas to central Jalisco and northern Nayarit. It lives at elevations of 1,045–2,600 m a.s.l. (Köhler 2021).

***Sceloporus exsul* (Dixon, Ketchersid & Lieb, 1972)**

Figure 3E

Material examined. MEXICO – **Querétaro** • Cadereyta de Montes, El Banco; 20.8844°N 099.7088°W; elev. 1981 m; 9.III.2022; Cristhian Alejandro Peralta-Robles and Fátima Soledad Garduño-Fonseca leg.; 1♂, CNAR-RF 902 (photograph).

These lizards were found under rocks in thorn scrub.

Identification. This is a small lizard (SVL=63 mm). The dorsal scales are strongly keeled, while the ventrals are smooth. There are 13–15 femoral pores. Gular and ventral coloration is completely white (Nieto and Pérez 1998).

Remarks. This is a micro-endemic species at high risk according to Mexican law NOM-059. It has been assessed as Critically Endangered by the IUCN. Little has been documented about the habits and general biology of this lizard. The first specimens in Queretaro were collected by Nieto and Pérez (1999).

Family Xantusidae

***Lepidophyma gaigeae* (Mosauer, 1936)**

Figure 3F

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, Soledad de Guadalupe; 21.3483°N, 099.2650°W; elev. 1488 m; 31.IX.2021; Fátima Soledad Garduño-Fonseca leg.; sex undetermined, CNAR-RF 903 (photograph).

The lizard was observed basking in a rocky outcrop.

Identification. This is small *Lepidophyma* species with a dorsoventrally compressed body (Leavitt and Hibbits 2012). It has relatively large dorsals, ventrals, and gulars, and microtubercles absent on the dorsal surface (Canseco-Marquez 2008).

Remarks. This species differs from all others in the genus, except for *L. tarascae* (Bezy, Webb & Álvarez, 1982), in having whorls of enlarged caudal scales dorsally separated by two whorls of intermediate scales, both complete ventrally. It lacks markedly enlarged lateral tubercles, as in *L. sylvaticum* (Taylor, 1939) (Bezy and Camarillo 2002). *Lepidophyma gaigeae* differs from all other congeners, except *L. dontomasii* (Smith, 1942), in that it has 39–73 lateral scales between the axilla and groin rather than 15–46 vertical rows of tubercles separated by small granular scales. It differs from *L. dontomasii* in having 28–39 femoral pores (<28 in *L. dontomasii*) (Bezy and Camarillo 1992).

***Lepidophyma occulor* (Smith, 1942)**

Figure 3G

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, San José de los Paredones; 21.6321°N, 099.2004°W; elev. 775 m; 22.VI.2022; Mauricio Tepos Ramírez obs.; sex undetermined, CNAR-RF 904 (Photograph).

This specimen was found under wet leaf litter in a subtropical forest.

Identification. This species is one of the largest species of the genus (♀ SVL = 102 mm; ♂ SVL = 90 mm; Dixon and Lemos-Espinal 2010) and can be easily distinguished from its congeners in Querétaro by having 15–42 enlarged, keeled tubercles on the side of the body and 23 or more femoral pores.

Remarks. It is found in thorny thickets in the Jalpan Valley of Querétaro and San Luis Potosí. This species is active at night near limestone outcrops and in rock walls and crevices. It occurs in Guanajuato, Tamaulipas, Hidalgo, San Luis Potosí, and Querétaro (Dixon and Lemos-Espinal 2010), although it is not an abundant species.

Family Xenosauridae

***Xenosaurus mendozai* (Nieto-Montes De Oca, García-Vázquez, Zúñiga-Vega & Schmidt-Ballardo, 2013)**

Figure 3H

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Tilaco; 21.1771°N 099.1690°W; elev. 1135 m; 9.VIII.2022; Cristhian Alejandro Peralta-Robles and Fátima Soledad Garduño-Fonseca leg.; 1♂, 1♀, CNAR-RF 905 (photograph).

These lizards were observed in oak forest where they occurred in holes in rocks in large rocky outcrops.

Identification. This species possesses two postrostral scales on each side of the midline. Supraocular scales are longer than wide. The body is brown, sometimes with diffuse and scattered dark spots on the side of the body and with transversal yellowish bands. The post-orbital region is rounded and does not present a temporal canthus delimited by enlarged or well-defined scales (Nieto et al. 2013).

Remarks. In Queretaro, it is known only from the vicinity of Tilaco and Acatitlán de Zaragoza in the Municipality of Landa de Matamoros, northeastern part of the state within the Sierra Gorda Biosphere Reserve (Nieto et al. 2013). It has also been recorded from El Pinalito, municipality of Jacala, Hidalgo (Zamora-Abrego 2009).

***Xenosaurus newmanorum* (Taylor, 1949)**

Figure 3C

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, San Juan de los Duran; 21.4966°N, 099.1679°W; elev. 1151 m; 1.X.2021; Brett Buttler obs.; 1♂, CNAR-RF 900 (photograph)

The specimen was observed in the cleft of a rock, in a transitional *Quercus* forest with elements of mountain mesophyll forest such as *Liquidambar styraciflua*.

Identification. *Xenosaurus newmanorum* is a medium-sized lizard, (♀SVL = 124 mm; ♂SVL = 118 mm). This species differs from other *Xenosaurus* species in having the zygomatic and postocular ridges separated, the supraorbital semicircles in contact or separated medially by one scale row, a smooth tympanum, and no enlarged canthal scales (Lemos-Espinal et al. 2012). The color pattern consists of a V-shaped dark mark on the neck; the dorsum usually exhibits four pale crossbands that alternate with dark crossbands. There is an immaculate pale gray to gray venter and laterally interrupted, dark-margined, pale caudal bands (Lemos-Espinal et al. 2012).

Remarks. This is a Mexican endemic lizard species previously reported from only two localities: the Municipality of Pisaflores in Hidalgo, and the Municipality of Xilitla in San Luis Potosí. Our new record represents the first of this species from Querétaro. This lizard species is of major conservation concern; it is under the category of Special Protection (DOF 2019) and has been assessed as Endangered by the IUCN. This species may not be able to survive in a highly modified vegetation community (Lara-Tufiño et al. 2013).

Order Squamata (Serpentes)
Family Boidae

***Boa imperator* (Daudin, 1803)**
Figure 4A

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, San José de los Paredones; 21.6321°N, 099.2004°W; elev. 775 m; 22.VI.2022; Fernando Hidalgo Licona obs.; sex undetermined, CNAR-RF 906 (photograph).

This snake was found under wet leaf litter in a subtropical forest.

Identification. This species has the following scale combinations: ventrals 225–288, subcaudals 49–70, supralabials 19–20, infralabials 20–24, scales around the body lacking apical depressions 55–88, scales between eyes across the top of the head 15–170, and an entire anal scale. A pattern of 20–33 middorsal spots is present (Dixon and Lemos-Espinal 2010). The dorsal color pattern is grayish brown, and the dorsum of the head is gray to bronze (Ramirez-Bautista et al. 2014).

Remarks. Until 2015 this species was considered to be subspecies of *Boa constrictor* Linnaeus, 1758. The geographic range is from southern Tamaulipas to eastern Colombia in South America (Card et al. 2016).

Family Natricidae

***Diadophis punctatus* (Linnaeus, 1766)**
Figure 4B

Material examined. MEXICO – **Querétaro** • Amealco de Bonfil, La Beata; 20.3138°N, 100.2361°W; elev. 2379 m; 20.VII.2022; Leonardo Álvarez Alvarado obs.; sex undetermined, CNAR-RF 907 (photograph).

This snake was seen basking in depressions in clay soil of an oak forest.

Identification. This is a small snake (TL = 677 mm) presenting the following scale characteristics and combinations: dorsal scales smooth without apical pits, supralabials 7 or 8, supralabials touching the orbit 2, infralabials 8, preocular and postocular usually 2. There is a cream to orange ring, with or without black margins, around the neck; this ring covers 2–4 scales (Dixon and Lemos-Espinal 2010).

Remarks. The species occurs from southern Canada to Mexico, from the Atlantic to the Pacific coasts, excluding most of the western deserts (Stebbins 1985). It is found in the Central Plateau and the Trans-Mexican Volcanic Belt in central Mexico (Hammerson and Frost 2007). It lives in a wide range of habitat types, such as grasslands, rocky and wooded slopes, chaparral, upland deserts, tropical and temperate forests, and thickets (Blanchard et al. 1979; Ernst and Ernst 2003; Ramírez-Bautista et al. 2009; Fernández-Badillo et al. 2016).

***Storeria dekayi* (Holbrook, 1839)**
Figure 4C

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Neblinas; 21.2546°N, 099.0686°W; elev. 1275 m; 28.VIII.2021; IBH-RF 650; Mauricio Tepos Ramírez obs.; 1♂, CNAR-RF 908 (photograph).

The specimen was found in a paddock surrounded by mesophyll forest.

Identification. The dorsal coloration is cinnamon, brown, or orange. There are keeled dorsal scales all over the body, no loreal scale, and the anterior temporal scale is uniform in color or with darker margin (Ramírez et al. 2014).

Remarks. This snake has a wide distribution from Canada to Central America in a variety of habitats. In Mexico it is distributed along the Gulf coast and the Sierra Madre Oriental in Nuevo León, Tamaulipas, San Luis Potosí, Puebla, and Hidalgo (Fernández-Badillo et al. 2016).

Family Colubridae

***Drymarchon melanurus* (Duméril, Bibron & Duméril, 1854)**

Material examined. MEXICO – **Querétaro** • Arroyo Seco, Purísima de Cubos; 21.2546°N, 099.0686°W; elev. 1275 m; Mauricio Tepos Ramírez obs.; 1♀.

The specimen was found in a paddock surrounded by mesophyll forest.

Identification. This is a large-bodied snake (TL = 2.295 mm) presenting the following scale combinations: parietal scales 2, supraocular 1, postoculars 2, preocular 1, supralabials 7 or 8, infralabials 7, middorsal scale rows 17. Vertical black stripes are present in the posterior

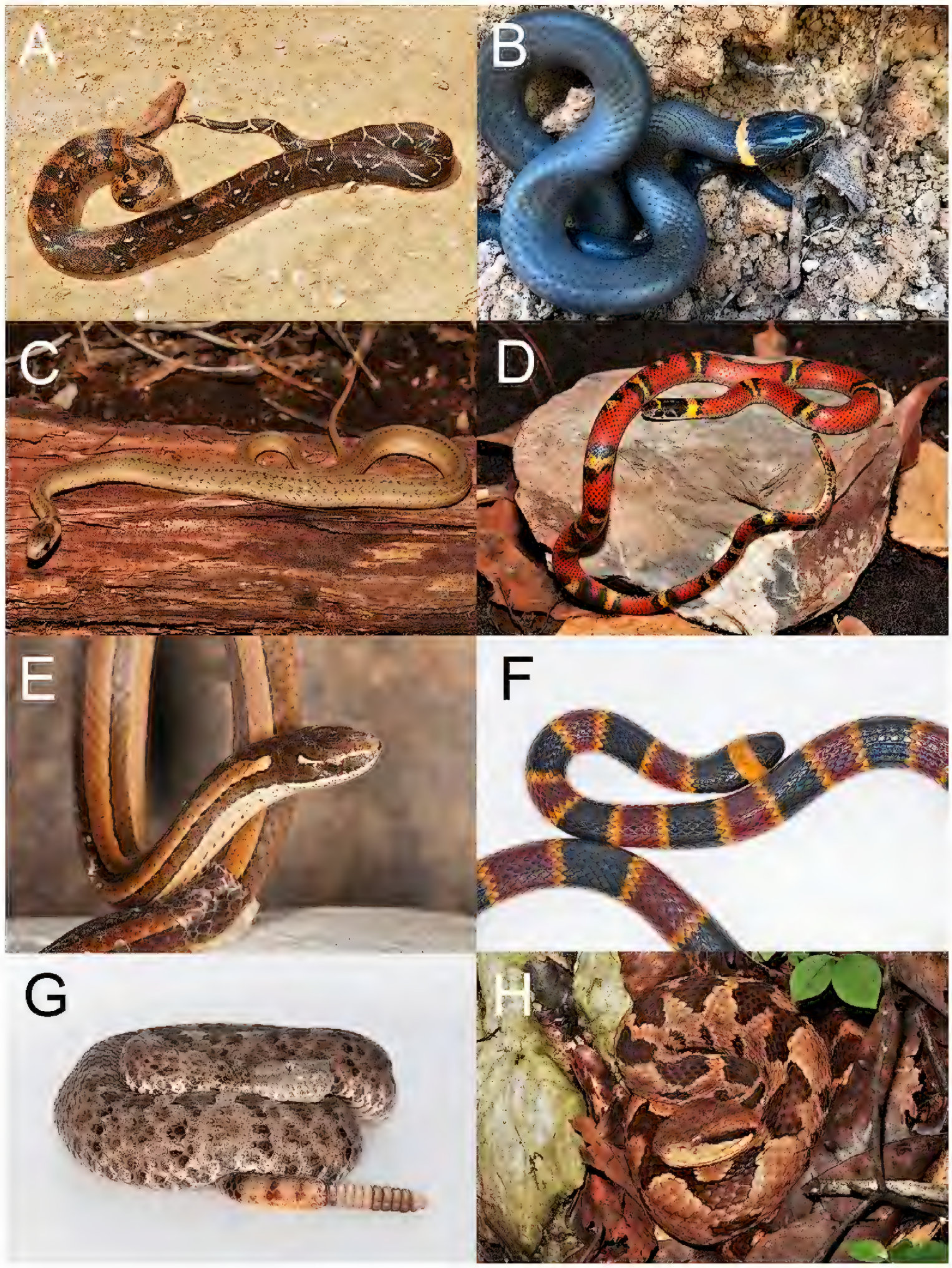

Figure 4. Some snakes of Querétaro, Mexico. **A.** *Boa imperator* (Daudin, 1803). **B.** *Diadophis punctatus* (Linnaeus, 1766). **C.** *Storeria dekayi* (Holbrook, 1839). **D.** *Scaphiodontophis annulatus* (Duméril, Bibron & Duméril, 1854). **E.** *Coniophanes imperialis* (Baird & Girard, 1859). **F.** *Micrurus tener* (Baird & Girard, 1853). **G.** *Crotalus aquilus* (Klauber, 1952). **H.** *Metlapilcoatlus borealis* (Tepos-Ramírez, Flores-Villela, Velasco, Pedraza-Lara, García-Rubio & Jadin, 2021). Photographs by ORGR (A, C–H) and Leonardo Álvarez Alvarado (B).

region of the subocular and supralabial scales (Dixon and Lemos-Espinal 2010; Ramirez-Bautista et al. 2014).

Remarks. A widely distributed species, ranging from southern Texas, USA to Venezuela, at elevations from sea level to 1900 m (Dixon and Lemos-Espinal 2010). Its habitat consists of dry subtropical forests, humid tropical forests, oak forests, and savanna (Stebbins 1985; Hammerson and Frost 2007; Rorabaugh and Lemos-Espinal 2016).

Scaphiodontophis annulatus (Duméril, Bibron & Duméril, 1854)

Figure 4D

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, San José de los Paredones; 21.6246°N, 099.1905°W; elev. 770 m; 24.VIII.2022; Cristhian Alejandro Peralta Robles obs.; sex undetermined, CNAR-RF 909 (photograph).

This specimen was found hidden underground in a subtropical forest. This observation represents the first record of this species in Querétaro.

Identification. This species presents the following scale combinations: ventrals 123–149 and subcaudals

234–262. The dorsum is red, with yellow bands bordered with black dorsal bands encompassing a pair of scales. The posterior half of the body often, but not always, exhibits a different color pattern, typically uniformly brown, with white chin (Kohler 2008).

Remarks. The typical habitat is humid lowland forests, also in subhumid forests in the extreme north of the Yucatan Peninsula (Kohler 2008). This is the only specimen known for Querétaro, so the color pattern of the population in general is unknown.

Family Dipsadidae

***Coniophanes imperialis* (Baird & Girard, 1859)**
Figure 4E

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Neblinas; 21.2586°N, 099.0549°W; elev. 862 m; 24.VIII.2022; Jonatan Pérez Coeto obs.; sex undetermined, CNAR-RF 910 (photograph).

This specimen was found on a dirt road, at the boundary between cloud and subtropical forest. This observation represents the first record of this species in Querétaro.

Identification. This species exhibits the following scale combinations: supralabials 8, infralabials 10, preoculars 2, postoculars 2, ventrals 130, anal and subcaudals divided (Ramírez-Bautista et al. 2014). The dorsum is light brown, with three dark brown stripes extending from head to tail, each covering two rows of scales. The head is dark brown, with a pale brown stripe from the tip of snout through the eye to the temporal region (Berriozabal-Islas 2012).

Remarks. In Mexico this species is distributed along the Gulf Slope from northern Tamaulipas to southern Chiapas, encompassing the entire Yucatan Peninsula where it inhabits humid and subhumid forests. It has also been reported in cloud forests (Ramírez-Bautista et al. 2014). This genus has recently been reviewed by Palacios-Aguilar and Flores-Villela (2020).

***Pantherophis emoryi* (Baird & Girard, 1853)**

Material examined. MEXICO – **Querétaro** • Cadereyta de Montes, Higuerillas; 20.9158°N 99.7648°W; elev. 1569 m; 31.VIII.2014; Mauricio Tepos Ramírez and Alfredo Acosta Ramírez obs.; 1♂, CNAR-RF 911a, b.

This specimen was found dead on a road, in xerophilous scrub habitat.

Identification. *Pantherophis emoryi* is a robust snake with a large head which is more differentiated from the neck than other in members of the *P. guttatus* complex. It has a background coloration of grey, olive, or brown, with brown and olive dorsal and lateral spots with black edges, but the most distinguishing character is a brown, reddish-brown, or almost black spear-shaped mark on the nape pointing toward the snout (Schultz 1996; Dixon and Lemos-Espinal 2010).

Remarks. It is distributed in the United States and Mexico. In Mexico it is found in San Luis Potosí, northern Veracruz, Chihuahua, northern Durango, Coahuila, Nuevo León, Tamaulipas, Querétaro, Jalisco, Hidalgo, and Aguascalientes (Calzada-Arciniega et al. 2015) (Bohannon et al. 2018). It lives in oak–táscate forests, dry thorny scrub forests, Chihuahuan Desert vegetation, canyons, and tropical deciduous forest.

Family Elapidae

***Micrurus tener* (Baird & Girard, 1953)**
Figure 4F

Material examined. MEXICO – **Querétaro** • Landa de Matamoros, Pinalito de la Cruz; 21.3200°N, 099.1698°W; elev. 2022 m; 29.IX.2021; Brett Buttler obs.; 1♂, CNAR-RF 912 (photograph).

This specimen was found on a rocky outcrop, in a pine–oak forest.

Identification. The species possess the following scale combinations: ventrals 200–231, caudals 26–46; midorsal rows 15, loreal scale absent (Campbell and Lamar 2004). The dorsum and venter have a series of red-yellow-black-yellow bands, while the tail has only black and yellow bands (Campbell and Lamar 2004). The head is black, with a yellow band that covers part of the parietal scales (Ramirez-Bautista et al. 2014).

Remarks. This species is distributed from eastern Texas, USA, passing through the Gulf Slope to northern Guerrero, Mexico. It is semifossorial and inhabits humid places, generally among leaf litter or under logs and rocks (Dixon and Lemos-Espinal 2010).

Family Viperidae

***Crotalus aquilus* (Klauber, 1952)**
Figure 4G

Material examined. MEXICO – **Querétaro** • Ezequiel Montes, Bernal; 20.7471°N, 099.9431°W; elev. 2050 m; 14.XII.2021; Mauricio Tepos Ramírez obs.; 1♀, CNAR-RF 913 (photograph).

This specimen was found basking on a rocky outcrop, among xerophytic scrub.

Identification. The species possess the following scale combinations: rostral wider than long; prenatal curves below the postnasal, anterior subocular is usually in contact with supralabials 4 and 5, long internasals in contact 2 or 3, canthals on each side 1 or 2, intercanthals 0–2, internasal–prefrontal area 5–10; intersupraoculars 2–5, loreals 1 or 2, infralabials 9–13; midbody dorsal scale rows 21–25 (usually 23), scales in contact with the rattlesnake 8–11 (Campbell and Lamar 2004; Dixon and Lemos-Espinal 2010; SEMARNAT 2018). The coloration generally ranges from pale brown or dark brown, gray, or greenish gray, and yellowish green to reddish brown. There are a couple of brown spots on the nape and 21–41 spots on the back, followed by 3–8 bands on the tail (SEMARNAT 2018).

Remarks. This is a Mexican endemic species, ranging from northwestern Veracruz to southern San Luis

Potosí and including Aguascalientes, Guanajuato, Hidalgo, Querétaro, Michoacán, Jalisco, and Zacatecas (SEMARNAT 2018). This species can tolerate some amount of disturbance from agricultural and industrial activities, as some populations persist in human-modified habitats (Meik et al. 2007).

***Metlapilcoatlus borealis* (Tepos-Ramírez, Flores-Villela, Velasco, Pedraza-Lara, García-Rubio & Jadin, 2021)**

Figure 4H

Material examined. MEXICO – **Querétaro** • Jalpan de Serra, El Pilón; 21.4990°N, 099.1730°W; elev. 1134 m; 30.VI.2015; Jacinto Chávez obs.; 1♀, CNAR-RF 914 (photograph).

This snake was found on vegetation of a transition zone between a *Quercus* forest and elements of the mountain mesophyll forest such as *Liquidambar styraciflua*.

Identification. *Metlapilcoatlus borealis* is a medium-sized, moderately robust viper (♀TL = 594 mm; ♂TL = 657 mm) with the following scale combinations: midbody scale rows 22– 25, nasorostral 4–6, ventrals 130–132, subcaudals 26–35, supraoculars 8–10, interoculabial 2 or 3, blotches at the sides of the body before the cloaca 21–26.

Remarks. Populations of *M. borealis* differ from the *M. mexicanus–M. nummifer–M. olmec* group, which are separated by two biogeographic barriers—the Trans-Mexican Volcanic Belt and the Sierra Madre Oriental. However, *M. borealis* may be sympatric with *M. nummifer*, especially in mid- and lowland areas in central and southern Veracruz, south of the Trans-Mexican Volcanic Belt (Tepos-Ramírez et al. 2021a).

Discussion

Our study demonstrates the importance of Querétaro as a reservoir of amphibian and reptile diversity in Mexico and highlights the importance of using rigorous methodologies and protocols to generate reliable checklists. The number of species that we report here is fewer than reported for neighboring states, such as San Luis Potosí (182 species; Lemos-Espinal et al. 2018), state of Mexico (150 species; Lemos-Espinal and Smith 2020), and Hidalgo (203 species; Ramírez-Bautista et al. 2020), but greater than in other, larger states, such as Nuevo León (132 species; Lemos-Espinal et al. 2016). Querétaro (51%) has a higher percentage of endemic species than San Luis Potosí (40%), but less than Hidalgo (53%), Guanajuato (57%), Michoacán (67%) and the state of Mexico (71%). Additionally, Querétaro only has one endemic species to the state, Michoacán 21 and the State of Mexico 5, while the rest of the neighboring states do not register any endemic species to the state (Table 5). However, the number of amphibians and reptiles reported in this study will continue growing with the description of new species (e.g. Campillo et al. 2021).

There are a large number of controversial records since the first published lists for Querétaro (Smith and Taylor 1950; Dixon et al. 1972; Nieto and Pérez 1999). Among amphibians, some of these controversial records are *Anaxyrus speciosus* (Girard, 1854), *Eleutherodactylus cystignathoides* (Cope, 1877), *Eleutherodactylus nitidus* (Peters, 1870), and *Aquiloeurycea scandens*; among reptiles, the controversial records are *Kinosternon scorpioides, Gerrhonotus liocephalus* (Wiegmann, 1828), *Scincella lateralis* (Say, 1822), *Lepidophyma flavimaculatum* (Duméril, 1851), *Pseudoelaphe flavirufa* (Cope, 1867), *Thamnophis marcianus* (Baird & Girard, 1853), *Agkistrodon taylori* (Burger & Robertson, 1951), *Crotalus ravus* (Cope, 1865), and *Crotalus triseriatus* (Wagler, 1830). Differences in the number of species reported for Querétaro may be due to four major causes outlined below. (More detailed discussion on controversial records considered in earlier checklists and recent nomenclatural changes can be found in the Appendix and Table A1, respectively.)

1) Taxonomic and nomenclatural changes. Among amphibians, there is confusion caused by numerous changes in the systematics of genera such as *Craugastor*

Table 5. Number of endemic species of amphibians and reptiles in Querétaro and neighboring states. The number of endemic species to Mexico include the number endemic species to the state.

State (reference)	Anura	Caudata	Testudines	Lacertilia	Serpentes	Species endemic to Mexico	Endemic state species	Total species
Querétaro (this paper)	12	7	1	23	26	69	1	136
Mexico State (Lemos Espinal and Smith 2020)	20	16	2	33	36	107	5	150
Guanajuato (Hernández-Arciga et al. 2018)	13	3	2	21	29	68	0	120
Michoacán (Suazo-Ortuño et al. 2019)	32	9	2	40	67	150	21	224
Hidalgo (Ramírez-Bautista et al. 2020)	22	16	3	25	42	108	4	203
San Luis Potosí (Lemos-Espinal et al. 2018)	12	5	3	25	28	73	0	182

(Cope, 1862) (Heinickie et al. 2007; Frost 2021), *Eleutherodactylus* (Duméril & Bibron, 1841) (Frost 2021), and *Lithobates* (Fitzinger, 1843) (Yuan et al. 2016; Frost 2021), *Eleutherodactylus* spp. are especially complex in this regard.

2) Erroneous identifications of specimens and outdated databases. Among reptiles, *Thamnophis marcianus* (Nieto and Pérez, 1999), *Lepidophyma flavimaculatum* (Nieto and Pérez, 1999). *Sceloporus serrifer* (Cope, 1866) (Nieto and Pérez, 1999) are examples of misidentifications acknowledged by collection curators but never properly corrected.

3) Species included in regional checklists by extrapolation but without recorded data/evidence. Among the amphibians, *Aquiloeurycea scandens* and *Pseudoeurycea leprosa* are two species without reliable records for Querétaro and their historical distribution do not include Querétaro (Parra-Olea et al. 2012; Raffaëli 2014; Frost 2021). Among reptiles, *Gerrhonotus liocephalus*, *Agkistrodon taylori*, and *Crotalus ravus* have been reported for Querétaro by Cruz-Elizalde et al. (2019, 2022); however, there is no reliable data or recollected specimens of these species from Querétaro, even in recent studies (García-Vázquez et al. 2018; Cisneros-Bernal et al. 2022). For that reason, neither species was included in this list.

4) Loss of specimens in collections, or confusion about locality names. For Querétaro, *Kinosternon scorpioides*, and *Pseudoelaphe flavirufa* were both reported by Dixon and Lemos (2010), and Cruz-Elizalde et al. (2019, 2022). *Pseudoelaphe flavirufa* may possibly occur in northern Querétaro.

Querétaro has been the subject of herpetofaunistic studies for five decades, and during this time several species have been described (Smith 1942; Dixon et al. 1972b; Nieto et al. 2013; Wallach 2016; Tepos-Ramírez et al. 2021a). Possible new species of lizards, frogs, and salamanders are currently under study. However, there are still gaps in the knowledge of species that occur in Querétaro. The inclusion of a species within a geopolitical area is not a trivial matter, especially when we consider that these borders are often delimited by environmental barriers, geography, and cultural elements. Addittionally, there are species known to occur just beyond the borders of Querétaro, for example, *Rhadinaea marcellae* (Taylor, 1949) and *Dryophytes plicatus* (Brocchi, 1877), which may occur in Querétaro; it is important to confirm their presence there.

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Author Contributions

Conceptualization: ORGR, MTR. Data curation: CAPR, MTR, FSGF. Formal analysis: ORGR. Funding acquisition: ORGR, RCJ. Investigation: FSGF, CAPR. Methodology: MTR. Project administration: RCJ, ORGR, MTR.

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Appendix

Taxonomy-based problems

Amphibians. In Queretaro, *E. cystignathoides* (Naturalista 2022) and *E. nitidus* (Cruz-Elizalde et al. 2019) had been included in previous checklists. However, they are not represented in scientific collections with records from Querétaro. Despite none of these species being present in the state (Hernández-Austria et al. 2022), we can confirm that viable populations of an unknown species of the *E. cystignathoides* complex, probably a species closely related to *E. campi*, occur in northeastern Querétaro.

Reptiles. Taxonomic changes were made in some genera of lizards, including *Holcosus* spp., *Aspidoscelis* spp., *Barisia* spp., and *Sceloporus* spp. (Martínez-Mendez and Méndez-De la Cruz 2007; Bryson and Riddle 2012; Harvey et al. 2012; Meza-Lázaro and Nieto-Montes de Oca 2015; Tucker et al. 2016), and snake genera, including *Epictia* spp., *Coniophanes* spp., *Hypsiglena* spp., *Lampropeltis* spp., *Leptodeira* spp., *Masticophis* spp., *Salvadora* spp., and *C. aquilus* (Mulcahy 2008; Daza et al. 2009; Ruane et al. 2014; McCraine and Hedges 2016; Wallach 2016; Hansen and Salmon 2017; Myers et al. 2017; Palacios-Aguilar and Flores-Villela 2020; Grünwald et al. 2021; Hernández-Jiménez et al. 2021). These have added many sources of confusion. The taxonomy has changed with the advancements in molecular systematics, and some species in Querétaro have had their name changed (Table S1).

In the case of *Crotalus triseriatus*, it is very morphologically similar to *Crotalus aquilus* (Uetz et al. 2021), which has caused confusion, especially if we consider that for decades *C. aquilus* was treated as a subspecies of *C. triseriatus*. Therefore, many of the collections in museums and publications prior to the recognition of *C. aquilus* as a species (Murphy et al. 2002) were cataloged as *C. triseriatus aquilus* or simply as *C. triseriatus*; such is the case of some specimens stored in foreign collections such as Harvard Museum of Comparative Zoology (MCZ-1578190). However, molecular studies (Bryson et al. 2011) have restricted the true *C. triseriatus* to the highlands of the Trans-Mexican Volcanic Belt, while *C. aquilus* is restricted to the highlands of the Sierra Madre Oriental, and there is no evidence of sympatry of both species in Querétaro (there is in the neighboring states of Hidalgo and Michoacán). Although it was impossible to review or request each record available in collections, they may be identical cases to the one mentioned above. We cannot rule out the presence of *C. triseriatus* in the state. Cruz-Elizalde et al. (2019) reported two species from Querétaro—*L. septeptrionalis* and *L. maculata*—however, the latter does not have any data or specimen deposited in a scientific collection to corroborate this, and there is only one record on the Naturalista platform from the municipality of Cadereyta de Montes. Thus, its presence must be corroborated and so we did not include *L. maculata* in our list.

Erroneous identification of specimens and outdated databases

Reptiles. *Thamnophis marcianus* was reported for the first time by Nieto and Pérez (1999), and the specimen was stored in the collection of amphibians and reptiles of the Carnegie Museum of Natural History under the catalog number CM-60100. In 2009, this specimen was reidentified by Dixon as *Thamnophis eques* (Kennedy-Gold pers. comm.). However, this change was not published and was only removed from the list published in Dixon and Lemos (2010). Another species misidentification is the case of *Lepidophyma flavimaculatum*, which was reported by Nieto and Pérez (1999). After analyzing photographs of the specimen (CM 73260), consulting and following Bezy and Camarillo (2002), we concluded that the specimen is *Lepidophyma sylvaticum*, as the postocular scales are in contact with the labial suture between the sixth and the seventh supralabial scale. Among lizards, *Sceloporus serrifer* is distributed in northwestern Mexico but was reported for Querétaro by Nieto and Pérez (1999; UTEP-14564). This

specimen was later identified as *Sceloporus cyanogenys* by curators of the museum of the University of Texas at El Paso. Nevertheless, this specimen does not share external morphological characters with *S. cyanogenys* according to the information published by Smith (1939), and it may be a new species, which is currently under description. Therefore, we have not included in our list.

Extrapolation

Amphibians. *Aquiloeurycea scandens* and *Pseudoeurycea leprosa* are entirely lacking records in available databases. *Aquiloeurycea scandens* is reported for Coahuila, San Luis Potosí, and Tamaulipas (Raffaëli 2014; Frost 2021), while *P. leprosa* is reported for Puebla, Veracruz, Morelos, CDMX, Guerrero, and Oaxaca (Parra-Olea et al. 2012).

Reptiles. *Gerrhonotus liocephalus* was reported from Querétaro by Cruz-Elizalde et al. (2019); however, molecular systematics and biogeography of *Gerrhonotus* spp. (García-Vázquez et al. 2018) have restricted the distribution of *G. liocephalus* to the Sierra Madre del Sur. Therefore, only two species are present in Querétaro, *G. infernalis* and *G. ophiurus*. The vipers *Agkistrodon taylori* (Cruz-Elizalde et al. 2019), *C. triseriatus* (Cruz-Elizalde et al. 2022), and *C. ravus* (Cruz-Elizalde et al. 2019) are species with no reliable information from Querétaro, even considering some new studies including several samples of *C. ravus* along its distribution (Cisneros-Bernal et al. 2022), and for that reason, both species were not included in our list.

Loss of specimens and confusion of localities

Reptiles. *Kinosternon scorpioides* is distributed along the Pacific slope, and, although few records cross the mountainous masses that separate the Gulf coastal plain from other biogeographic regions such as Trans-Mexican Volcano Belt, Sierra Madre Oriental, or Sierra Madre de Oaxaca, it is unlikely that this species occurs in Querétaro. The only specimen recorded from Querétaro is stored in the herpetology collection of the Museum of Comparative Zoology at Harvard University (MCZ R-5311). This specimen came from Agua Blanca, Quintana Roo, while Dixon and Lemos (2010) reported *K. scorpioides* in Querétarofrom Agua Blanca, Amealco. It is probable that the similarities between the names and state abbreviations of the localities caused this confusion. *Pseudoelaphe flavirufa* was reported by Nieto and Pérez (1999) from the municipality of Peñamiller, Querétaro, and stored at University of Texas at Arlington (UTA-14699). However, it was impossible to locate the specimen under that catalog number (Greg Pandelis pers. comm.). *Pseudoelaphe flavirufa* has few records, especially in the northernmost part of its distribution. Therefore, due to the absence of the specimen, and because this species is confused with other species such as juveniles of *Senticolis triaspis*, we have not included in our list.

Table A1. Taxonomic changes in the herpetofauna of Querétaro.

Species	Taxonomic change	Reference
Amphibians		
Craugastor loki	*Craugastor rhodopis*	Streicher et al. 2014
Ecnomiohyla miotympanum	*Rheohyla miotympanum*	Duellman et al. 2016
Hyla arenicolor	*Dryophytes arenicolor*	Duellman et al. 2016
Hyla eximia	*Dryophytes eximius*	Duellman et al. 2016
Pseudoeurycea bellii	*Isthmura bellii*	Rovito et al. 2015
Pseudoeurycea cephalica	*Aquiloeurycea cephalica*	Rovito et al. 2015
Rhinella marina	*Rhinella horribilis*	Acevedo et al. 2016
Reptiles		
Ameiva undulata	*Holcosus amphigrammus*	Meza-Lazaro and Nieto-Montes de Oca 2015
Barisia imbricata	*Barisia ciliaris*	Bryson et al. 2012
Cnemidophorus gularis	*Aspidoscelis gularis*	Reeder et al. 2002
Sceloporus torquatus	*Sceloporus melanogaster*	Campillo et al., 2021
Coluber flagellum	*Masticophis flagellum*	O'Connell et al. 2017
Coluber mentovarius	*Masticophis mentovarius*	O'Connell et al. 2017
Coluber schotti	*Masticophis schotti*	O'Connell et al. 2017
Epictia goudotii	*Epictia wynni*	Wallach 2016
Lampropeltis triangulum	*Lampropeltis polyzona*	Ruane et al. 2014
Oxybelis aeneus	*Oxybelis potosiensis*	Jadin et al. 2020
Coniophanes piceivittis	*Coniophanes taeniatus*	Palacios-Aguilar and Flores-Villela 2020
Salvadora grahamiae	*Salvadora lineata*	Hernández-Jiménez et al. 2021
Tropidodipsas sartorii	*Geophis sartorii*	Grünwald et al. 2021